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ORIGINAL ARTICLE

Longitudinal oncology registry of head and neck carcinoma (LORHAN®): initial supportive care findings

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Abstract
Goals of work We report the first analysis of demographic, socioeconomic, and toxicity data from the Longitudinal Oncology Registry of Head and Neck Carcinoma (LORHAN).
Materials and methods Eligible patients include newly diagnosed Head and Neck Cancer (HNC) patients, scheduled to receive radiotherapy or drug therapy, ≥18 years of age, and able to provide informed consent. Assessments are completed at baseline, at the completion of therapy, and yearly thereafter. Patient data are entered in the registry electronically and transferred via Secure HTTP protocols.
Results Reported use of supportive care differed by treatment setting. When compared to community sites, patients at academic centers received more supportive interventions: feeding tube (59% vs. 48%; $p=0.001$), tracheotomy tube (16% vs. 9%; $p=0.002$), opioid analgesics (89% vs. 59%; $p<0.0001$), anti-emetics (83% vs. 68%; $p<0.0001$), and amifostine (17% vs. 12%; $p=0.02$). Reported grades 3–4 mucositis/stomatitis was also higher in patients treated at academic centers (38% vs. 28%; $p=0.001$).
Conclusion There was a marked decrease in the documented use of supportive care measures in the community setting. This may be due to (1) lower rates of toxicity requiring less supportive care, (2) less stringent documentation, or (3) less aggressive use of supportive care measures. The documented rate of mucositis was less than expected. This is likely due to inadequate assessment or documentation. Further exploration of these findings is warranted as they may indicate an under appreciation and undertreatment of clinically significant acute tumor and treatment-related toxicities.

Keywords Head and neck carcinoma · Supportive care · Registry · Toxicity · Symptom control

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Introduction

Over the past several decades, there have been marked advances in our knowledge about the biology and treatment of head and neck carcinoma. For patients with locally advanced disease, randomized clinical trials have demon-

strated an improvement in local control and survival with the use of aggressive combined modality therapy [1–4]. Unfortunately, improved treatment outcomes come at the cost of a marked increase in morbidity [5]. Clinicians and patients must weigh the potential risks and benefits of therapy on a case by case basis in order to make appropriate treatment decisions.

Randomized clinical trials represent a select subset of head and neck cancer patients. First and foremost, most clinical trials are restricted to patients with a good performance status. In addition, elderly patients, minorities, and patients with lower socioeconomic status are often under represented. Although one can extrapolate data from randomized trails to these cohorts of patients, there is inherent danger in doing so. The balance between toxicity and treatment outcome may be markedly different for patients who have significant co-morbidities at the time of diagnosis, for the frail elderly, or for those without the financial or social supports needed to sustain them through aggressive treatment regimens. Furthermore, treatment regimens for head and neck cancer therapy are complex; thus, they require an experienced, coordinated multidisciplinary team of practitioners who can address the multitude of treatment and supportive care issues that face the head and neck cancer patient. Inexperienced practitioners or those without adequate support services may be unprepared to meet the challenge of caring for these complex patients.

In order to address these and other issues, investigators developed the Longitudinal Oncology Registry of Head and Neck Carcinoma (LORHAN). LORHAN is a national registry developed in 2005 whose primary objective is to prospectively collect observational data that describe patterns of care of patients with head and neck carcinoma [6]. A patient registry can provide information on a population of patients in the "real world" and can be particularly useful in describing the strategies actually being employed by practitioners and tracking their outcomes over time. Health care practitioners from both academic and community settings are participating allowing a comparison between patient characteristics and patterns of care based on treatment setting. LORHAN differs from current general cancer registries because it captures in-depth data on patient characteristics, including socioeconomic factors, treatment, related toxicity, and supportive care measures. Herein, we report the initial supportive care findings from the LORHAN database.

Materials and methods

Eligibility

Patients are eligible if they are 18 years of age or older and have pathologically (histologically or cytologically) confirmed new diagnosis of carcinoma involving the oral cavity, oropharynx, nasopharynx, hypopharynx, larynx, or neck node metastasis from unknown origin. Patients must be scheduled to receive radiotherapy and/or drug therapy (chemotherapy, biologic, or targeted therapy) for their disease and provide written informed consent. Patients are excluded if they will receive surgery alone or if their treatment with radiation therapy or drug therapy was initiated or completed prior to enrolling in LORHAN. Concurrent enrollment in clinical trials is permitted. Studies are approved by the local Institutional Review Board. All patients are required to provide written informed consent prior to study enrollment.

Before enrolling a patient, participating physicians designated as principal investigators must complete a site/practice profile. In the profile, a physician defines his practice/site as academic or community.

Assessments

Assessments are completed at baseline, at the completion of therapy, and yearly thereafter. At baseline, clinical, demographic, and socioeconomic data are collected. Clinical information includes date of diagnosis, primary site, histology, stage, performance status, and use of radiographs. Demographic and socioeconomic data includes race/ethnicity, education, household income, number of individuals in the household, smoking history, and alcohol history. Treatment information includes data on the following: (1) surgery including the date and the type of surgery (curative, debulking, or staging), (2) radiation therapy including the start and stop date, the schedule and the type of radiation, (3) chemotherapy including the drug, dose, and date administered, and (4) treatment toxicity and the use of supportive care measures. Toxicities were graded using the NIC CTCAE version 3.0. Incidence of severe toxicities during treatment is recorded and focuses on mucositis/stomatitis, skin/dermatology, allergic reactions/hypersensitivity, and infusion reactions. Data are also entered on supportive care received including use of opioid analgesics, anti-emetics, and feeding tubes or tracheotomy tubes. Information was also obtained regarding enrollment on clinical trials for head and neck cancer. Yearly follow-up assessments include patient status, disease status, further treatment if indicated, and long-term adverse effects (tracheostomy tubes, feeding tubes). Patients are followed for at least 2 years and up to 10 years. If a patient is initially treated at an academic center and is subsequently treated in the community (or vice versa), information on that patient continues to be collected by the enrolling investigator.

For this analysis, we reviewed baseline clinical, demographic, and socioeconomic data as well as the supportive care and acute toxicity data.

Data entry and management

Patient data are entered by the physician or his/her staff into electronic case report forms that are located on the registry's website. Data are subject to both manual and automated error checking during electronic entry with procedures that look for logical inconsistencies, out of range values, and missing data.

Data are electronically transferred to MedNet Solutions (Minnetonka, MN, USA) via the registry website. The registry website enforces restricted access control mechanisms and incorporates encrypted point-to-point data transfer via Secure HTTP protocols. Patient and physician confidentiality are strictly maintained. Patients entered into the registry are referenced by an identification number only.

Statistical analysis and data reporting

Analyses of data are primarily descriptive in nature and directed toward describing patient characteristics, toxicities, and patterns of supportive care use for head and neck cancer patients undergoing treatment. For categorical and ordinal variables, frequencies and percentages are calculated. For continuous variables, descriptive statistics (n, mean, median, standard deviation, and range) are used.

Null hypothesis testing utilizes chi-square, t test, and other nonparametric tests as required. All tests are performed under a two-sided hypothesis with a two-tailed p value of less than or equal to 0.05 to reject the null hypothesis. Any survival-based analysis is performed using Kaplan–Meier methodology with right censoring as appropriate. Any comparisons are performed under a two-sided hypothesis using a log rank test, with a two-tailed p value of less than or equal to 0.05 to reject the null hypothesis.

Results

One hundred sixty-four physicians from 85 sites are enrolling patients in LORHAN, of which 94 are designated as principal investigators. Patients are being enrolled in LORHAN from 30 states; all geographies (north, east, south, and west) are represented. A majority of the principal investigators (79%) work in community-based practice settings; 21% are affiliated with an academic center. Between December 2005 and July 21, 2008, 1,877 patients were enrolled. Of patients enrolled, more than 80% have locked baseline and initial treatment records and are the subject of this report (Fig. 1).

Baseline clinical and demographic characteristics can be found in Table 1. Patients treated at academic sites were younger (58 vs. 62 years of age; $p<0.0001$), had more advanced disease (stage IV, 70% vs. 50% of patients; $p<0.0001$), and had a lower performance status (PS) $p<0.0001$) compared to those at community sites. In addition, community sites treated more patients with laryngeal tumors. Other clinical characteristics did not differ between settings.

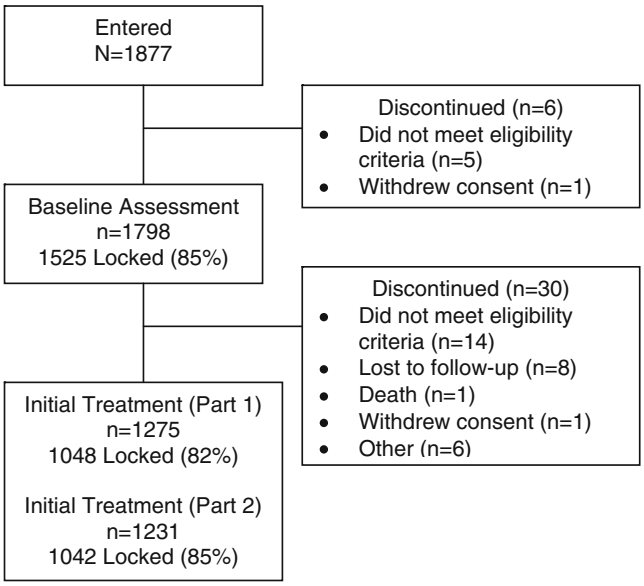

Fig. 1 CONSORT diagram of patient disposition

Highest education level completed, and household income did not differ by treatment setting (Table 3). Approximately 15% of patients had less than a high school diploma. Twenty-five percent of patients had a high school degree. Only 19% of patients had a bachelor's or more advanced degree. One third of patients did not report their income. Of the remaining patients, 20% reported an annual income of less than $20,000. There was a slightly higher number of "others in the household" for patients treated at academic centers (1.5 vs. 1.3 persons; $p=0.05$) versus community sites. Overall, 17% of patients lived alone, 50% of patients had one other person living in their household, and 33% of patients had two or more people living in their household. Significantly, more patients were enrolled in a clinical trial for head and neck cancer at academic sites (22% vs. 14% of patients; $p=0.0003$).

Reported use of tobacco and alcohol did not differ between treatment settings. Twenty-three percent of patients never smoked. Sixty-five percent smoked cigarette only. Of those patients who smoked, 72% reported having quit smoking. For patients who indicated that they used tobacco, the mean age for starting tobacco use was 18 years of age. On average, patients have been using tobacco for 33 years. Twenty percent of patients had never consumed alcohol. Of those who previously consumed alcohol, 52% now abstain. Patients who indicated that they consumed alcohol started using alcohol at a mean of 20 years of age. On average, these patients have been consuming alcohol for 35 years.

Table 1 Demographic and clinical characteristics

Characteristic	Intergroup comparisons						
	ALL N=1,524		Academic n=1,013		Community n=511		p Value
	No.	%	No.	%	No.	%	
Gender							
Female	360	24	229	23	131	26	
Male	1,164	76	784	77	380	74	
Race							
White (non-Hispanic)	1,233	81	800	79	433	85	
Black (non-Hispanic)	208	14	152	15	56	11	
Hispanic	37	2	27	3	10	2	
Other	46	3	34	3	12	2	
Age (years)							
Mean	59		58		62		<0.0001
Range	19–97		19–89		21–97		
Performance status (Zubrod)							
0	530	36	299	31	231	47	<0.0001
1	646	44	460	47	186	38	
2	255	17	192	20	63	13	
≥3	41	3	25	3	16	3	
Missing	52	3	37	4	15	3	
Mean	0.9		1		0.7		<0.0001
Primary tumor site[a]							
Oropharynx	619	41	423	42	196	38	
Larynx	302	20	173	17	129	25	0.0001
Oral cavity	250	16	171	17	79	16	
H & N unknown	79	5	56	6	23	5	
Nasopharynx	66	4	39	4	27	5	
Salivary gland	64	4	44	4	20	4	
Hypopharynx	62	4	44	4	18	4	
Other	81	5	63	6	18	4	
Histology							
Squamous cell	1,388	91	919	91	469	92	
Other	136	9	94	9	42	8	
Staging (TNM)							
I	121	9	51	6	70	15	<0.0001
II	134	10	84	9	50	11	
III	261	19	144	16	117	25	
IV[b]	883	63	651	70	232	50	
Missing	122	8	81	8	41	8	

[a] Primary tumor site is missing for one patient

[b] 2% of patients had metastatic disease at diagnosis as indicated by M1 in TNM staging

Treatment

Treatment was highly variable (Table 2). A minority of patients received induction chemotherapy. Eighty-one percent of patients received intensity modulated radiation therapy (IMRT) as their form of radiation. With the exception of patients receiving curative surgery followed by chemoradiation, there were no differences in type of treatment employed between academic and community settings (Table 3).

Supportive care measures

Reported use of supportive care differed by treatment setting (Table 4). More patients received a feeding tube at academic sites (p=0.0042). A minority of patients had feeding tubes placed prior to starting therapy (17%—academic; 18.7%—community, no significant difference). Community sites were less likely to place feeding tubes once therapy had started (40.8%—academic; 29.6%—

Table 2 Initial treatment received

	Intergroup comparisons						
	ALL N=1,041		Academic n=680		Community n=361		p Value
	No.	%	No.	%	No.	%	
Concurrent chemoradiation (CRT)	350	34	221	33	129	36	
Radiotherapy (RT) alone	181	17	118	17	63	18	
Curative surgery followed by CRT	174	17	133	20	41	11	0.0007
Induction CT followed by CRT	123	12	77	11	46	13	
Curative surgery followed by RT	96	9	59	9	37	10	
CT alone	26	3	15	2	11	3	
Induction CT before Curative Surgery and/or RT	25	2	14	2	11	3	
RT followed by CT	2	0.2	1	0.1	1	0.3	

Sixty subjects could not be categorized and four subjects are in multiple categories

community). The majority of feeding tubes were placed after the initiation of treatment. Tracheotomy tubes were placed in 15.9% of patients treated at academic sites versus 9.2% for community sites (p=0.0033. Median duration of feeding tube use and tracheotomy tube use was 100 and 23 days, respectively, and did not differ by setting. There was a striking difference in the documented use of opioids with 88.8% of patients at academic center reporting the use of opioids versus 58.6% at community sites (p<0.0001). Overall, the most commonly prescribed opioids were

Table 3 Socioeconomic characteristics

	Intergroup comparisons						
	ALL N=1524		Academic n=1013		Community n=511		p Value
	No.	%	No.	%	No.	%	
Highest education level completed							
8th or less	65	4	38	4	27	5	
9th–11th	157	10	99	10	58	11	
High school graduate/GED	396	26	242	24	154	30	
Vocational/technical school	76	5	52	5	24	5	
Associate degree/some college	261	17	180	18	81	16	
Bachelor's degree	189	12	136	13	53	10	
Advanced degree	112	7	77	8	35	7	
Unknown/other	268	18	189	19	79	16	
Household income ($)							
Under 20,000	229	19	162	19	67	18	
20,000–29,000	82	7	48	6	34	9	
30,000–39,999	86	7	50	6	36	10	
40,000–49,999	76	6	55	7	21	6	
50,000–74,999	153	13	98	12	55	15	
75,000–100,000	79	7	62	7	17	5	
>100,000	99	8	78	9	21	6	
Unknown/other	407	34	284	34	123	33	
Number of others in household							
0	238	17	149	16	89	18	
1	694	50	451	50	243	50	
≥2	460	33	306	34	154	32	
Mean	1.4		1.5		1.3		0.05

Information for number of others in the household is missing for 132 patients.

Table 4 Use of supportive care measures

	Intergroup comparisons			
	ALL (%)	Academic (%)	Community (%)	*p* Value
Feeding tube placed	55	59	48	0.001
Tracheotomy tube placed	13	16	9	0.002
Opioid analgesics prescribed	79	89	59	<0.0001
Anti-emetics prescribed	78	83	68	<0.0001
Amifostine prescribed	15	17	11	0.02

hydrocodone (39%), oxycodone (34.8%), fentanyl (33%), and morphine (18.3%). Seventy-two percent of patients received oral opioid formulations, 30.2% received transdermal opioid formulations, and 11.3% received IV opioid therapy. Academic sites documented anti-emetic use in 82.7% of patients versus 67.6% at community sites ($p<$ 0.0001). Overall, the most commonly used antiemetics were decadron (48%), ondansetron (39.4%), prochlorperazine (39.4%), aprepitant (29.3%), ativan (24.1%), palinosetron (23.7%), promethazine (12.8%), metoclopramide (12.3%), dolasetron (9.9%), and granisetron (6.1%). Fifty percent of patients received IV anti-emetics, and 62.5% received oral formulations. Amifostine was used in 17.0% of patients treated at academic centers compared to 11.8% at community centers (p=0.003).

Treatment-related toxicity

Grade 3–4 mucositis/stomatitis was reported in 34% of all patients. For patients receiving radiation therapy alone, the grades 3–4 mucositis rate was 35.7% at academic centers and 14.4% at community centers (p=0.0002). For patients treated with chemoradiation, the difference was no longer evident with grade 3–4 mucositis rates of 39.7% and 32.9% at academic and community sites, respectively. (Figure 2) Other grades 3–4 toxicities, including skin/dermatology, infusion reactions, and allergic reactions, did not differ by treatment setting. Grades 3–4 radiation dermatitis was noted in 15.8% of patients. There was a difference in the radiation dermatitis rate for chemoradiation (20.2%) versus radiation alone (6.3%); however, the difference did not achieve statistical significance. Mean weight was 80 kg with mean weight loss of 6 kg (Fig. 3). Weight loss did not differ by treatment setting.

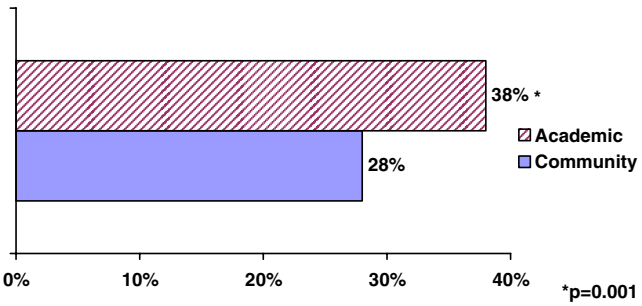

Fig. 2 Grades 3–4 mucositis/stomatitis

Discussion

LORHAN provides comprehensive, longitudinal data describing the patterns of care for head and neck cancer patients. We report the initial analysis of sociodemographic and supportive care data derived from LORHAN. Our results demonstrated that there were significant differences in patient demographics, treatment toxicity, and the use of supportive care interventions when comparing patients treated at academic versus community sites.

Randomized clinical trials have demonstrated that aggressive multimodality treatment regimens improve outcome in head and neck cancer patients with locally advanced disease [1–4]; however, concern has been expressed regarding the appropriateness of applying the results of these studies to the general head and neck population. It has often been argued that patients treated at community sites are older, more frail, and have increased rates of co-morbid disease. These characteristics may predispose patients to poor tolerability of aggressive

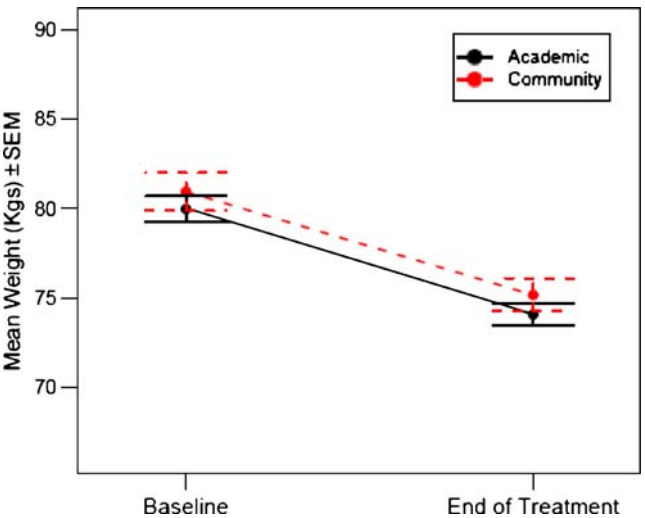

Fig. 3 Weight loss between baseline and end of treatment

treatment regimens as well as a decrease in clinical benefit [7, 8].

Findings from the LORHAN database would indicate that patients treated at community sites are older than those treated at academic institutions. Whether elderly patients derive the same survival benefit with concurrent chemoradiation has yet to be elucidated because of the low accrual of elderly patients to clinical trials. In a SWOG retrospective review of enrollment to 164 clinical trials [9], elderly patients (who composed 63% of the cancer patients within the United States) represented only 25% of patients enrolled on SWOG clinical trials. Among head and neck cancer patients, the elderly represented 49% of the population but only 24% of those entered on clinical trials. Because of the low accrual rates to clinical trials, data regarding treatment outcomes is limited. That being said, there is a growing literature that counters the prevailing thought that "fit" elderly patients do not tolerate aggressive therapy. Surgical mortality rises with increasing age [10]; however, this is thought to be secondary to the increased rates of co-morbidities. Indeed, the available surgical [11–13] and radiation therapy literature demonstrate that appropriately selected elderly HNC patients tolerate therapy as well as their younger counterparts [14–16]. Whether elderly patients benefit from aggressive chemoradiation regimens is a separate question. The meta-analysis of radiotherapy demonstrated an improvement in overall survival for patients treated with altered fractionation schedules (HR of 0.92; 0.86–0.97, p=.003) [17]; however, the survival benefit was lost in patients >70 years of age. Similarly, the meta-analysis of chemotherapy in head and neck cancer [18] demonstrated an improvement in overall survival for the use of concurrent chemotherapy plus radiation versus radiation alone; in patients >70 years of age, the survival benefit was lost. The loss of benefit was postulated to be due to increased rates of death from intercurrent illness. Future analysis of the LORHAN database may be able to address the question of risk and benefits of therapy in the elderly patient population.

Co-morbid disease and performance status clearly impact survival and treatment tolerability [8, 19]. The LORHAN database does not capture information on baseline co-morbid disease; however, it does capture performance status at baseline. It was predicted that patients with poor performance status would be less likely to travel to academic sites for therapy and would receive therapy locally. Unexpectedly, academic sites were more likely to treat patients with a poor performance status. There are several potential explanations for this observation. First, academic sites were more likely to treat patients with advanced disease, and patients with more advanced disease may present with decreased performance status. Second, academic institutions frequently care for the indigent or uninsured patient population. This cohort of patients is more likely to present for medical care late in the course of disease processes and frequently have high rates of co-morbidities. Finally, patients with extensive co-morbidities complicating their cancer diagnosis and treatment may be referred to academic centers for management. The reason for the underlying decrease in performance status at academic sites bears further investigation.

The literature would suggest that head and neck cancer patients generally have a lower socioeconomic status, lesser degrees of education, and fewer social supports when compared to the general patient population [20–24]. Data from the LORHAN registry would support the supposition that head and neck cancer patients had low levels of education: only 19% of patients had a bachelor's degree or higher. Data on household income was missing for over 30% of patients; thus, any conclusions about the socioeconomic status are difficult to make. We did obtain information regarding the number of people living within the household which can be used as a gross indicator of social support. One out of five patients lived alone, and 50 percent of patients had only one other person living within the household. Head and neck cancer treatment is complex and time consuming. It is critical for patients to identify and work with family and friends who can provide care when needed. Patients without any persons within their household to aid in caregiving may not be able to comply with complicated treatment regimens.

Although there were no significant differences in treatment regimen between academic and community sites, there was a marked difference in the reported use of supportive care measures. Feeding tube and tracheotomy tube placement were more frequent at academic centers. Documents indicate that patients treated at academic centers were 30% more likely to receive opioids for pain control. Anti-emetic agents and amifostine were also used more commonly at academic sites. Similarly, there was a difference in the reported rate of toxicities at academic sites. Patients treated with radiation therapy at academic sites were reported to have more grades 3–4 mucositis than patients treated at community sites. There was an increase in radiation dermatitis at academic sites, although the difference was not statistically significant.

These observations are important and require thoughtful review and explanation, since the implications for patient care are significant. Several potential explanations may be considered. First, our data indicates that patients treated at academic sites have more advanced disease and worse performance status; thus, they may require more aggressive interventional procedures and pharmaceutical support in order to deal with the acute effects of cancer therapy. Patient and tumor characteristics may indeed partially explain these observations. However, it is more likely that

these observations are related to differences in patterns of care at academic and community sites.

Another possible explanation for the differences in reported use of supportive care measure is that documentation at community sites may be less consistent. One could argue that patients are being adequately assessed and treated; however, the documentation of these services is less rigorous. Lack of documentation of treatment-related symptoms and toxicity is well described within the literature [25] and remains a major barrier for adequate symptom control. In the head and neck cancer population, this is most evident with the reporting of mucositis [26]. It has been previously noted that the rate of mucositis is higher in studies where mucositis is the primary outcome measure [27]. This reflects both the experience and focus of the treating physician.

Finally, it is possible that patients receiving care at community sites are being assessed and treated for adverse effects in a less aggressive manner. Most academic centers have experienced teams of clinicians who are accustomed to dealing with the acute and late effects of head and neck cancer and its treatment. Experienced staff may identify supportive care issues more readily and may be more aggressive in their treatment. Furthermore, academic institutions have access to experienced subspecialists who may feel more comfortable performing procedures on head and neck cancer patients.

Regardless of the reason for the decrease in reported use of supportive care measures at community sites, steps need to be taken to address the potential deficiencies and improve quality of care. Physicians and health care providers need to be educated about the proper assessment, treatment, and documentation of acute and late effects of therapy. In particular, head and neck cancer patients undergoing radiation-based treatment must be assessed on a frequent basis throughout their treatment course and routinely afterwards until they have recovered sufficiently from the acute effects of therapy. Subsequently, patients must be monitored for the development of late effects such as worsening fibrosis with decreased swallow function, neck and shoulder range of motion, hearing loss, nutritional deficiencies, and oral health issues. With regard to the use of opioids, appropriate assessment and documentation of pain is not only vital for patient quality of life; it is also mandated by state and federal agencies.

LORHAN has important strengths and limitations. As with any dataset, representativeness, completeness, and data quality influence the reliability and generalizability of the findings. Physicians participating in LOHAN have chosen to contribute to the study. There may be differences in practice patterns between physicians who chose or chose not to participate in registries and/or clinical trials. Physician self-selection may introduce a bias that calls for a cautionary note in interpretation of results.

Participation in LORHAN requires written informed consent by the patient. Participating physicians are encouraged to approach all eligible patients; however, we cannot be certain how, if at all, patients participating in LORHAN may differ from those who do not. Patient characteristics from this initial report suggest that patients participating in LORHAN are similar to those whose data are entered in other national registries. Since physicians are participating from both academic and community settings, we expect that LORHAN findings may be more generalizable than other cancer registries.

The level of data missingness in LORHAN is very low. Of patients enrolled, 2% have discontinued before progression or death. While these patients have discontinued LORHAN, the protocol allows for a linking with the National Death Index, minimizing lost to follow-up for vital status information.

Data quality is monitored by the LORHAN Advisory Board, whose role is to guide the design, conduct, analysis, and reporting of LORHAN. The advisory board reviews data on an ongoing basis looking for logic and consistency and predefines normal ranges for selected variables from which hard edit checks are created. Reports of outliers are generated, and sites are contacted to confirm data points, as needed. While information entered into LORHAN is not audited against source documents, these reviews provide some measure against systematic error/bias. Random error is expected to be addressed as the patient number in LORHAN grows.

Conclusions

The initial findings from LORHAN indicate that there is a marked difference in the documented use of supportive care measures in the community setting. This may be due to (1) lower rates of toxicity in a younger population with less advanced disease and better PS, (2) less stringent documentation, or (3) less aggressive use of supportive care measures. The documented rate of mucositis was less than expected. This may be due to inadequate assessment or documentation. Initiatives must be undertaken to educate health care providers about the need for aggressive assessment, treatment, and documentation of acute and late effects of therapy.

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